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APR 20 2006

Patent  
Avago Technologies Docket No.: 10004263-1

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of: Rene P. Helbing et al.

Application No.: 10/087,152

Filed: March 1, 2002

For: **SPECTRAL DISPERSION COMPENSATION  
IN OPTICAL CODE DIVISION MULTIPLE  
ACCESS (OCDMA) COMMUNICATION SYSTEM**

)  
Group Art Unit: 2638  
)  
Examiner: Tran, Dzung D.  
)  
Docket No.: 10004263-1  
)  
Confirmation No. 2625

DECLARATION OF RENE P. HELBING UNDER 37 C.F.R. §1.131

Mail Stop Amendment  
Commissioner of Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

SMITH FROHWEIN TEMPEL  
GREENLEE BLAHA LLC  
CUSTOMER NO. 35856

Sir:

I, Rene P. Helbing, state the following:

1. I am a co-inventor of the subject matter disclosed, and claimed, in the above-referenced patent application.
2. The invention of the above-referenced patent application was conceived at least as early as December 12, 2001, as evidenced by the Agilent Technologies Invention Disclosure Form, assigned PDNO No. 10004263-1, a true and accurate copy of which is attached hereto as Exhibit A. From prior to December 12, 2001, I diligently pursued the preparation of a U.S. Utility Patent application. Prior to December 12, 2001, the invention disclosure was submitted in accordance with Agilent Technologies' corporate procedures. During the time from prior to December 12, 2001, to March 1, 2002, I continued to develop the invention as permitted given my usual workload, which included assisting in the preparation of many U.S. patent applications. I diligently

**DECLARATION OF RENE P. HELBING UNDER 37 C.F.R. §1.131**  
Application No. 10/087,152  
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assisted in the preparation of the above-identified U.S. patent application, the filing of which constitutes a constructive reduction to practice of the subject matter disclosed, and claimed, in the above-referenced patent application.

4. On October 1, 2001, I approved the final draft of the above-identified patent application. See Exhibit B.
5. On December 20, 2001, Agilent Technologies, Inc. authorized the filing of the above-identified patent application. See Exhibit C.
6. On or about January 29, 2002, the final patent application and declaration were forwarded to me by Agilent's outside patent counsel, Thomas, Kayden, Horstemeyer & Risley, L.L.P. See Exhibit D.
7. Based on the description of the spectral dispersion compensation system as detailed in the Agilent Technologies Invention Disclosure Form, assigned PDNO No. 10004263-1, a person having ordinary skill in the art would be possessed of sufficient information to practice the invention at least as early as December 12, 2001, and would consider the invention to be constructively reduced to practice no later than March 1, 2002.

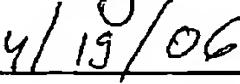
**DECLARATION OF RENE P. HELBING UNDER 37 C.F.R. §1.131**

Application No. 10/087,152

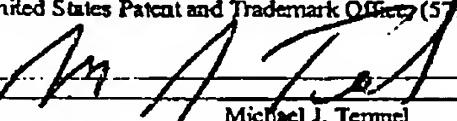
Avago Technologies Docket No.: 10004263-1

Page 3

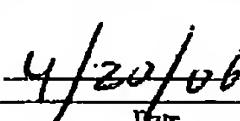
I HEREBY DECLARE that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the above-referenced patent application, or any patent issued thereon.

  
\_\_\_\_\_  
Rene P. Helbing  
\_\_\_\_\_  
  
\_\_\_\_\_  
Date**CERTIFICATE OF FACSIMILE TRANSMISSION UNDER 37 C.F.R. § 1.8**

I hereby certify that this correspondence, including any items indicated as attached or included, is being transmitted via facsimile transmission to the United States Patent and Trademark Office (571) 273-8300, on the date indicated below.



Michael J. Tempel



Date

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Agilent Technologies

EXHIBIT A

## INVENTION DISCLOSURE

PDNO 10004263 DATE RCVD

ATTORNEY JH

PAGE ONE OF

Core/PTD

**Instructions:** The information contained in this document is COMPANY CONFIDENTIAL and may not be disclosed to others without prior authorization. Submit this disclosure to the Agilent Technologies Legal Department as soon as possible. No patent protection is possible until a patent application is authorized, prepared, and submitted to the Government.

Descriptive Title of Invention:

InTEGRATED dispersion compensation in point-to-point networks  
to enable optical CDMA

Name of Project:

Product Name or Number:

Was a description of the invention published, or are you planning to publish? If so, the date(s) and publication(s):

Was a product including the invention announced, offered for sale, sold, or is such activity proposed? If so, the date(s) and location(s):

Was the invention disclosed to anyone outside of AGILENT TECHNOLOGIES, or will such disclosure occur? If so, the date(s) and name(s):

If any of the above situations will occur within 3 months, call your IP attorney or the Legal Department now at 1-553-3061 or 408-553-3061.

Was the invention described in a lab book or other record? If so, please identify (lab book #, etc.)

Was the invention built or tested? If so, the date:

Was this invention made under a government contract? If so, the agency and contract number:

**Description of Invention:** Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).

- A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).
- B. Problems solved by the invention.
- C. Advantages of the invention over what has been done before.
- D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

Signature of Inventor(s): Pursuant to my (our) employment agreement, I (we) submit this disclosure on this date: [ ]

461481 RENE HELBLING

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name
91651	KEN WILDNER	<i>Ken Wildner</i>			
Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name
M.					
Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name
Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name

(If more than four inventors, include additional information on another copy of this form and attach to this document.)

## Integrated inter-channel dispersion compensation in point-to-point and broadcast networks for enabling optical CDMA

Long-haul, especially trans-continental and trans-ocean fiber spans, are limited in capacity because they have to use the existing fiber that is in the ground. Laying additional fiber is very complicated and expensive. Therefore, network operators are increasing the bandwidth of the available fiber by using higher data rates and high density WDM. However, current speed and channel count have almost reached their physical limits. Chromatic dispersion, polarization mode dispersion, available filters and the speed of modulators do not allow a significant increase in fiber bandwidth.

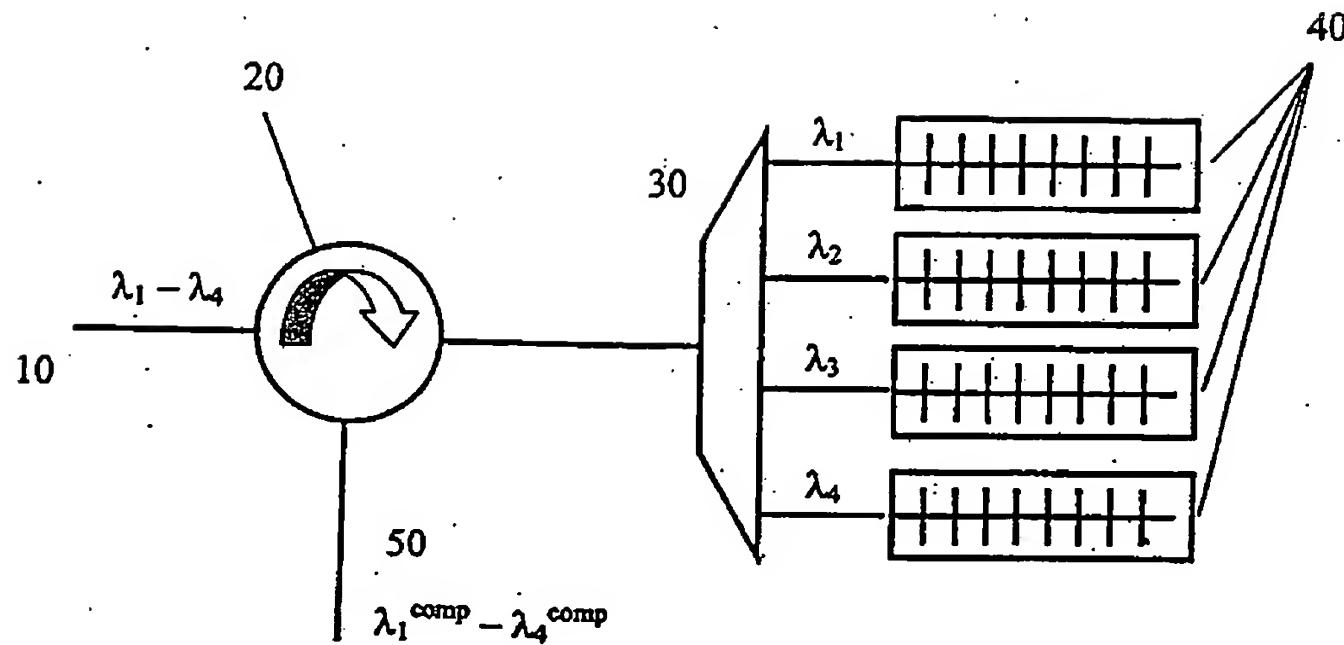
In analogy to CDMA in wireless networks, Optical Code Division Multiple Access (OCDMA) has been proposed to increase the capacity of fiberoptic networks. Instead of encoding data on individual wavelength channels, a combination of time and wavelength encoding across all channels is used. Much higher bandwidth is achievable using this encoding scheme. In addition, higher security is provided and over-subscription of fibers can be used if some noise is tolerated.

However, OCDMA is not compatible with today's WDM networks that implement dynamic wavelength routing because there is no guarantee that all wavelengths from the transmitter arrive at the receiver.

OCDMA can be used, however, in broadcast networks and individual point-to-point links because these architectures require to route all available wavelengths from the transmitter to the receiver(s). Long-haul spans between cities and trans-ocean links can be viewed as a series of individual point-to-point transmissions, as long as the data across the optical channels is converted to the electrical domain, restored and re-transmitted with OCDMA.

In order to implement OCDMA, the encoded data across all wavelength channels has to arrive at the receiver at the same time. Because light travels at different speeds for different wavelengths, the data across multiple wavelengths would arrive at the receiver at different times. Even though dispersion compensation in long-haul networks is used to prevent broadening of the data pulses, it is designed only to eliminate intra-channel effects because the individual channels on standard WDM systems all carry independent data.

This disclosure proposes dispersion compensation across all wavelength channels in a multi-wavelength system to enable OCDMA. One implementation of the invention is shown in figure 1. Light pulses from a long-haul fiber span 10 enter the dispersion compensating system via a non-reciprocal element like a circulator 20. The data stream is separated into individual wavelength channels in a demux 30. The data on each channel then enters the compensating elements 40, where each element is adjusted so that it compensates not only for each channel individually, but provides compensation across all channels. In the implementation shown in fig.1, Bragg gratings are used for compensation. Because Bragg gratings are reflective elements, the wavelengths are multiplexed at the mux / demux 30 and exit the system through the circulator 20.



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Tempel, Mike

Exhibit B

From: rene\_helbing@agilent.com  
Sent: Monday, October 01, 2001 7:48 PM  
To: mike.tempel@tkhr.com  
Subject: RE: 10004263

*DRAFT-3*  
Mike,  
I think it looks great now. I have no more changes.

Regards,  
Rene

-----Original Message-----

From: Tempel, Mike [mailto:mike.tempel@tkhr.com]  
Sent: Tuesday, September 25, 2001 11:57 AM  
To: Helbing, Rene (A-Labs)  
Subject: 10004263

Hi Rene,

Revised draft and drawings attached. Password convention remains the same.  
Please contact me if you have any problems with the documents.

I revised some description and added FIG. 4. Please review.

Best Regards,  
Mike

<<50110-1410.ZIP>>

Tempel, Mike

EXHIBIT C

**From:** ANDERSON,CLIFTON (Non-A-PaloAlto,ex2) [clif\_anderson@non.agilent.com]  
**Sent:** Thursday, December 20, 2001 2:18 PM  
**To:** Tempel, Mike'  
**Subject:** 10004263 Helbing

Mike,

Once the inventor has approved this application, you send formal papers to the inventor for execution without further approval from me.

Clif



## THOMAS, KAYDEN, HORSTEMEYER &amp; RISLEY, L.L.P.

ATTORNEYS AT LAW

EXHIBIT D

INTERNATIONAL PATENT, TRADEMARK AND COPYRIGHT LAW AND RELATED LITIGATION

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January 29, 2002

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 STEPHEN R. RISLEY  
 JEFFREY R. KUESTER  
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 GINA C. CHENG\*\*  
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 PATENT AGENTS  
 \*PROVISIONALLY REGISTERED

ROBERT J. STARR  
 SAM HAN, PH.D.  
 TROY VAN AUCKEN  
 CHRISTOPHER T. SMYTH  
 TECHNICAL ADVISORS

Rene P. Helbing  
 3500 Deer Creek Road  
 MS 26M-10  
 Palo Alto, California 94303

*Via Federal Express*  
USA Airbill No. 827719514624

Re: U.S. Utility Patent Application  
 Title: Spectral Dispersion Compensation in Optical Code  
 Division Multiple Access (OCDMA) Communication  
 System

Serial No.: To Be Assigned; Filing Date: To Be Determined  
 Inventor(s): Rene P. Helbing and William R. Trutna, Jr.  
 Agilent Docket: 10004263-1; TKHR Docket: 050110-1410

U.S. Utility Patent Application  
 Title: Multiple Modulated Wavelengths in a Compact Laser  
 Serial No.: To Be Assigned; Filing Date: To Be Determined  
 Inventor(s): Rene P. Helbing and William R. Trutna, Jr.  
 Agilent Docket: 10004262-1; TKHR Docket: 050110-1420

Dear Rene:

Enclosed please find the declarations and assignments for the above-identified applications. We would appreciate you having Mr. Trutna, as well as yourself, sign the documents where indicated. Please note that the Assignments must be signed in the presence of a Notary Public. Further all names should be signed exactly as they are typed.

After all documents have been signed and notarized, please return them to our office in the enclosed Federal Express envelope so that we may file with the U.S. Patent and Trademark Office.

---

Suite 1750, 100 Galleria Parkway, N.W., Atlanta, Georgia 30339-5948 U.S.A.

Rene P. Helbing  
January 29, 2002  
Page 2

Please feel free to call if you have any questions or comments concerning the enclosed documents.

Sincerely,

THOMAS, KAYDEN,  
HORSTEMEYER & RISLEY, LLP



Michael J. Tempel

MJT/lk  
Enclosures

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